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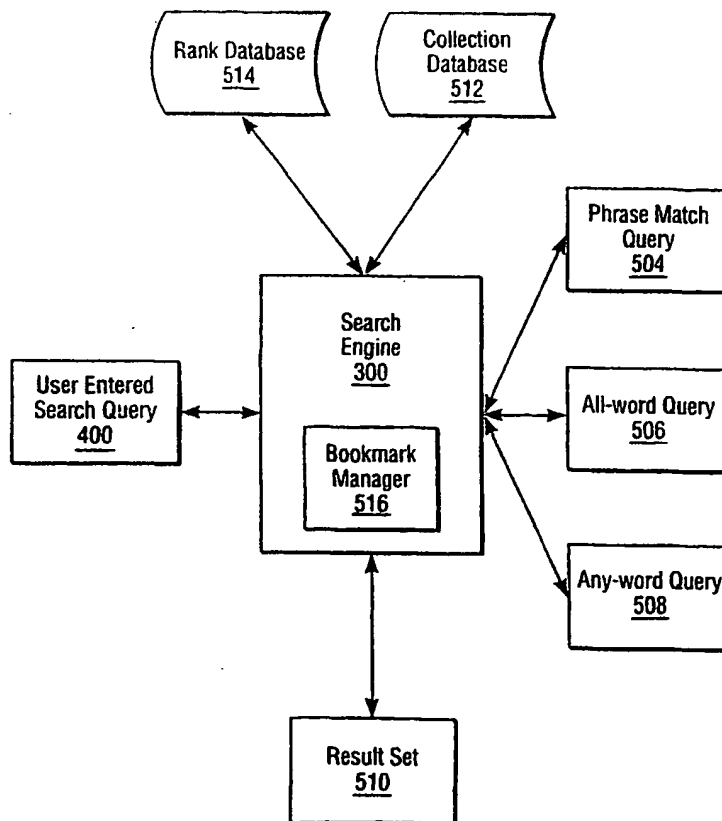
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[Continued on next page]

(54) Title: **AN INTERNET SEARCH SYSTEM FOR TRACKING AND RANKING SELECTED RECORDS FROM A PREVIOUS SEARCH**



(57) Abstract: A system and method that enable Internet users to access selected records retrieved from results set (510) that are derived from earlier search queries. The invention tracks and ranks selected records that users deemed valuable to a search query. When an Internet user submits a search query (400), the system creates three distinct but related queries for searching all accessible web sites, a collection database (512) and a rank database (514). The collection database includes a list of collections, i.e., records that other users deem relevant to a search topic and that are selected from result sets derived with earlier search queries; the collection is organized in a folder/file based hierarchical format. The rank database includes Uniform Resource Locators (URLs) for identifying web sites that are bookmarked by other users. Each record in the collection and rank databases has an associated score that is used to organize records retrieved from those databases. Thus, when the user submits a search query to the system, it returns selected records from the collection and rank databases, in addition to other related web sites from the Internet.

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AN INTERNET SEARCH SYSTEM FOR TRACKING AND RANKING SELECTED RECORDS FROM A PREVIOUS SEARCH

Field of the Invention

This invention relates to a computer search system and more particularly to a search system and method in a computer network for sharing and ranking retrieved preselected records that are organized in a hierarchical format.

5

Background of the Invention

Advances in computer processing power and network communications have made information from a wide variety sources available to users on computer networks. Computer networking allows network computer users to share information, software applications and hardware devices and internetworking enables a set of physical networks to be connected into a single network such as the Internet. The World Wide Web (Web), a hypermedia system used on the Internet, enables hypertext linking, whereby documents automatically reference or link other documents located on connected computer networks around the world. Thus, users connected to the Internet have almost instant access to information stored in relatively distant regions.

10
15

A page of information on the Web may include references to other Web pages and may include a broad range of multimedia data including textual, graphical, audio, and animation information. Currently, Internet users retrieve information from the Internet, through the Web, by 'visiting' a web site on a computer that is connected to the Internet.

20

The web site is, in general terms, a server application that displays information stored on a network server computer. The web site accepts connections from client programs, such as Internet browsers, and the client programs allow Internet users to access information displayed on the web site. As

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hardware. By using TCP/IP Layering model protocols, any component connected to the network can communicate with any other component connected directly or indirectly to the one of the attached networks.

5 Presently, an Internet user may log on the Internet through server 102 and a browser application program, such as Microsoft Explorer™ or Netscape™ browser, on client computer system 104-110. The browser displays text and/or graphic information on Web pages through the client computer system 104-110 screen and permits the user to navigate through the Web using a mouse. Furthermore, some of the Web page information may be highlighted to indicate that
10 an item is a hypertext, or pointer to another document. Fig. 3 illustrates an inventive search engine 300 that is used to search for web sites related to a particular topic. Search engine 300 is preferably executed on server 102 although it may be executed on client computer system 104-110. The user may access search engine 300 through the browser and submit a search query related to a specific
15 topic to it.

Fig. 4-A illustrates a search query 400 that may be submitted to a currently used search engine, such as AltaVista™ search engine. Search query 400 includes multiple query terms 402. The user may modify search query 400 with special characters, such as a plus sign, '+', a minus sign, '-', and left and right parenthesis, '()', and with Boolean terms such as 'AND', 'OR', and 'AND NOT'. For example,
20 when the user enters several query terms 402 in a search query, AltaVista™ search engine searches for pages containing at least one of those query terms. Adding a plus sign, '+', before a query term 402 ensures that the query term 402 will appear on every page the AltaVista™ search engine returns. If the minus sign, '-', precedes query term 402, the search engine will only retrieve records that do not
25 contain the query term. The user may also search for exact phrases by enclosing search terms in quotation marks. Fig. 4-B illustrates a search query that includes special characters and Fig. 4-C illustrates a search query that includes Boolean

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characters. It should be apparent that other modifications may be made to search query 400.

Fig. 5 illustrates how search engine 300 in the inventive system processes search query 400. Specifically in a preferred embodiment of the invention, search engine 300 converts search query 400 into a phrase match query 504, an all-word query 506, and an any-word query 508. Phrase match query 504 is used for locating records containing a phrase made up of all query terms 402, but excluding the first special character or Boolean term. Search engine 300 uses all-word query 506 to locate records containing all search terms 402 and it uses any-word query 508 to search for records containing any search terms 402 entered by the user and to search for records that contain a variation of each search term 402. For example, if the user entered 'record' as a search term, any-word query 508 will retrieve records containing 'record', 'records', 'recording', and 'recorded'. During the query conversion, if search engine 300 determines that multiple queries 504-508 will produce identical results, then only one of the queries is used. Upon executing queries 504-508, search engine 300 also eliminates duplicate records retrieved by multiple queries.

After queries 504-508 are constructed, search engine 300 searches a collection database 512 and a rank database 514 for any records that satisfy the queries. Collection database 512 contains 'collections,' which is a user created folder based on hierarchical format. Each collection contains organized and pre-selected records, related to a specific topic, that are derived from earlier searches. Rank database 514 contains searchable URL records that are associated with bookmarked web pages. During collection database 512 search, search engine 300 associates a score with each query 504-508 in order to determine the precedence of records retrieved from each query. Query scores may be modified to vary the priority of records retrieved by each query 504-508. Records retrieved from queries 504-508 are combined into one result set 510 and they are sorted according

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to their associated scores. Result set 510 is typically truncated at a predetermined number to limit the number of records that are transmitted to the user. A record score is associated with each record in result set 510 for further determining the relevancy of each record to the search term entered by the user. Search engine 300
5 increases a record's score each time a search term occurs in the record and based on the location of the search term in the record. Thereafter, the entire result set 510 is sorted according to the user's sorting choice. Examples of sorting based on the user's choice include sorting based on the record's score; sorting based on the record's creation date; sorting based on the record activity level; sorting based on
10 the rating assigned to each record by other users; sorting based on the last updated date of each record; and sorting based on the number of URLs links associated with each record. After sorting result set 510, it is displayed on the web page for the user to examine.

In the inventive system, the user may also bookmark each web page, in
15 result set 510, that contains relevant information. Moreover, the user may use tools in the inventive system to bookmark pages found through other search engines. The URLs associated with the bookmarked web pages are organized into a hierarchical tree structure similar to a computer file structure. Fig. 6 illustrates a preferred embodiment of the bookmark hierarchical tree structure 600. Structure
20 600 may be categorized into collections 602-606 and 612 and folders 608. Collections 602-606, 612 may be designated as public collections 604, 612, collections viewable by any user and collections that may appear in searched result set 510, or designated as private collections 602, 606, collections viewable only by the creator.

25 Upon creating a public collection, the user must identify the collection type either as a "general list" of bookmarks or as a specific topic. An example of a general list identification is "John Smith's Favorite" and example of a specific topic identification is "Computer Gaming Sites". If the user identifies the collection as

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a general list, the record is stored in rank database 514 and a URL is provided to the user for publishing the collection. Thereafter, other users may access the collection either through a result set returned by search engine 300 or by entering the URL directly into a browser. If the user identifies the collection as a specific topic, the collection must be submitted for approval. The collection is evaluated based on predefined criteria, for example, the number of links in the collection or no empty folders in a collection. Upon approval of the collection, the system prompts the user to enter personal information such as creator's email address and the title, description and keywords associated with the collection. The collection is then stored in collection and rank databases 512, 514 and it is searchable by search engine 300.

The system tracks and ranks each URL based on bookmarking activity performed on the associated web site. Since a score associated with a bookmarked web page is increased each time a user bookmarks the pages, a collection 602-606, 612 may improve search results even though it is designated as a private collection. In other words, a user casts a vote for a web site by bookmarking the site.

Specifically, a bookmark manager application 516 in the system tracks individually bookmarked web pages, assigns scores to associated URL records and maintains the assigned score. Bookmark manager 516 searches rank database 514 and increases the URL record's score each time the associated web page is bookmarked by a user. Fig. 7 illustrates the URL record 700 associated with bookmarked web pages. Record 700 is stored in collection and rank databases 512, 514 and it includes the URL of an associated bookmarked web page 702, a title of the web page 704, and a collection placement 706. Collection placement 706 is used to specify which collections and/or folders, if any, contain the bookmark. Record 700 may also include a description of the web page 708 and keywords or phrases 710 that are related to the contents of the web page.

The first time a particular web page is bookmarked by a user, record 700 is

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transmitted to the rank database 604. If record 700 already exists in database 604, a score associated with it is incremented and if it does not exist, it is inserted into the database and a score is assigned to it. Then the system updates statistical information about the collection. Examples of statistical information include the number of bookmarks in collection 502-506, 512, the number of folders in the collection 502-506, 512, the names of folders that are contained in the root of collection 502-506, 512 and the last update date of collection 502-506, 512.

After record 700 is inserted into 604 rank database, bookmark manager 516 processes any keywords 710 included in record 700 by determining if keyword 710 already exists for that URL in another record. If it does, bookmark manager 516 increments a score associated with that keyword. If it does not exist, bookmark manager 516 assigns a score to the keyword. The top ten keywords 710, keywords with highest scores, are selected and placed in a list where they can be easily searched and associated with the appropriate URLs.

In order to prevent URLs associated with earlier bookmarked pages from having higher scores because of an earlier bookmark date and not necessarily because of relevance to a search topic, bookmark manager 516 periodically, for example once a month, recalculates/rebuilds the score associated with each URL record. Each record 700 in rank database 514 includes six additional fields 710-720 for storing six time periods. The first field 712 stores the number of times the associated page was bookmarked since the last rebuild process, the second field 714 stores the number of times the associated page was bookmarked between the last rebuild process and the second last rebuild process and so on. Thus, the sixth field 722 initially stores the number of times between the two earliest rebuild time periods that the associated page was bookmarked. It should be noted that the length of the time between rebuild periods is not as important as consistency between time periods.

Bookmark manager 516 uses the following formula to recalculate the score

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associated with each URL record:

$$\text{Score} = (P1*3) + (P2*2.5) + (P3*2) + (P4 * 1.5) + (P5*1) + (P6 *.5)$$

— P1 represents the number stored in the first field; P2 represents the number stored in the second field; P3 represents the number stored in the third field; P4 represents the number stored in the fourth field; P5 represents the number stored in the fifth field; and P6 represents the number in the sixth field.

Upon rebuilding URL record's 700 score, bookmark manager 516 sets the value of first field 712 to zero and shifts the value of fields 714-720. Hence, second field's 714 value is set to the previous value of first field 712; third field's 716 value is set to the previous value of second field 714; fourth field's 718 value is set to the previous value of third field 716; and fifth field's 720 value is set to the previous value of fourth field 718. The previous value of fifth field 720 is added to the value of the sixth field 722 and the sixth field 722 is used as an accumulator.

Fig. 8 illustrates a flow chart of how system 300 processes search queries 400 entered by the user according to a preferred embodiment. In Step 810, system 300 converts search query 400 into a phrase match query 504, an all-word query 506 and an any-word query 508 and associates a score with each query. In Step 820, search engine 300 searches collection and rank databases 512-514, and searches all accessible web sites for any sites that satisfy the queries. In Step 830, search engine 300 combines records retrieved from each query 504-508 in a result set. In Step 840, search engine 300 assigns a score to each record in the combined result set and adjusts the assigned score in order further determine the relevance of each record to the search topic. In Step 850, search engine 300 sorts the result set 510 based on the user's sorting choice and displays the sorted result set on a computer screen through a browser.

Fig. 9 illustrates a flow chart of how the system processes collections and bookmarked web pages in the collection and rank databases 512-514 according to a preferred embodiment of the invention. In Step 910, a user bookmarks a web

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page that contains information relevant to a specific topic and places the bookmark in a collection. Thereafter the user designates the collection as a public or private collection. In Step 920, search engine 300 determines if the bookmark is part of a collection and if the collection is a public or private collection and it updates statistical information about the collection. In Step 930, the bookmark manager searches rank database 514 for the bookmark and it maintains the score of the associated URL record 700. If this is the first bookmark of a particular page, URL record 700 is stored in rank database 514 and a score is assigned to record 700, else, the score is incremented. In step 940, the bookmark manager provides a URL for the collection to the user and the user may submit a specific topic-public collection for approval. In Step 950, upon approval of the collection the user updates the collection information for storage in the collection database. In Step 960, the bookmark manager processes any keywords included in URL record 700 and selects the keywords with the highest score. In Step 970, the bookmark manager periodically recalculates the score associated with each record and resets the values of the appropriate fields.

The foregoing description has been directed to specific embodiments of this invention. It will be apparent, however, that other variations and modifications may be made to the described embodiments, with the attainment of some or all of their advantages. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

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CLAIMS

What is claimed is:

1. A system connected to an expanded network for ranking bookmark web pages, the system comprising:
 - 5 a browser for bookmarking selected web sites;
 - a first database for storing records comprising Uniform Resource Locator (URL) associated with each bookmarked web site; and
 - a software component that searches the first database, tracks individual records associated with bookmarked web pages, assigns a score to each record, and
 - 10 maintains the assigned score.
2. The system of claim 1, wherein the software component increase the record score each time a user bookmarks the web site associated with the record.
- 15 3. The system of claim 2 wherein the record in the first database comprises:
 - a URL of the bookmarked web site;
 - a title for identifying the web site; and
 - a placement number for specifying other files where the URL associated
 - 20 with the bookmark web site is stored.
4. The system of claim 3, wherein the record further comprises:
 - a description of the web site; and
 - a plurality of keywords that relate to contents of the web page.
- 25 5. The system of claim 4, wherein the record in the first database may be stored in a second database.

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6. The system of claim 5, wherein the software component:
assigns a score to each of the plurality of keywords when the record is first
inserted in the first database;
determines if each keyword in the plurality of keywords already exists in
another record; and
increments the score assigned to each keyword in the plurality of keywords
if the keyword exists in another record;
7. The system of claim 6, wherein the software component selects a second
plurality of keywords with the highest scores and stores the second plurality of
keywords in a table.
8. The system of claim 7, wherein the software component periodically
recalculates the score associated with the record.
9. The system of claim 8, wherein the record further comprises a plurality of
additional fields for storing time periods.
10. The system of claim 9, wherein
a first of the plurality of additional fields is used for storing a number of
times the web page was bookmarked since a last recalculation;
a second of the plurality of additional fields is used for storing a number of
times the web page was bookmarked since a second last recalculation;
a third of the plurality of additional fields is used for storing a number of
times the web page was bookmarked since a third last recalculation;
a fourth of the plurality of additional fields is used for storing a number of
times the web page was bookmarked since a fourth last recalculation;

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a fifth of the plurality of additional fields is used for storing a number of times the web page was bookmarked since a fifth last recalculation; and

a sixth of the plurality of additional fields is used for storing a number of times the web page was bookmarked since an initial sixth last recalculation.

5

11. The system of claim 10 wherein the sixth of the plurality of additional fields is used as an accumulator and upon each recalculation, the software component adds the value in the fifth of the plurality of additional fields to the value in the sixth of the plurality of additional fields.

10

12. The system of claim 11, wherein the software component assigns new values to the plurality of additional fields after each periodic recalculation.

15

13. The system of claim 12, wherein the software component uses a predefined formula and the values of the plurality of additional fields to periodically recalculate the score associated with each record in the first database.

20

14. The system of claim 13, wherein the predefined formula comprises:
a first product of three times a value in the first of the plurality of additional fields;

a second product of two point five times a value in the second of the plurality of additional fields;

a third product of two times a value in the third of the plurality of additional fields;

25

a fourth product of one point five times a value in the fourth of the plurality of additional fields;

a fifth product of one times a value in the fifth of the plurality of additional fields; and

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a sixth product of point five times a value in the sixth of the plurality of additional fields.

5 15. The system of claim 14, wherein the first to sixth products are added together in the predefined formula.

10 16. A system connected to an expanded network for ranking bookmark web pages, the system comprising:
a browser for bookmarking selected web sites;
a first database for storing records comprising Uniform Resource Locator (URL) associated with each bookmarked web site; and
means for transmitting records associated with bookmarked web sites to the first database, for searching the first database, for tracking individual records associated with bookmarked web pages, for assigning a score to each record, and
15 for maintaining the assigned score.

17. The system of claim 16, further comprising means for increasing the record score each time a user bookmarks the web site associated with the record.

20 18. The system of claim 17, further comprising means for creating records in the first database, the record comprises:
a URL of the bookmarked web site;
a title for identifying the web site; and
a placement number for specifying other files where the URL associated
25 with the bookmark web site is stored.

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19. The system of claim 18, further comprising means for storing a description of the web site and a plurality of keywords that relate to contents of the web page in the record.

5 20. The system of claim 19, further comprising means for storing the record in the first database in a second database.

21. The system of claim 20, further comprising means for:
assigning a score to each of the plurality of keywords when the record is
10 first inserted in the first database;
determining if each keyword in the plurality of keywords already exists in another record; and
incrementing the score assigned to each keyword in the plurality of
keywords if the keyword exists in another record;

15 22. The system of claim 21, further comprising means for selecting a second plurality of keywords with the highest scores and for storing the second plurality of keywords in a table.

20 23. The system of claim 22, further comprising means for periodically recalculating the score associated with the record.

24. The system of claim 23, further comprising means for storing time periods in a plurality of additional fields in the record.

25 25. The system of claim 24, further comprising means for:
storing a number of times the web page was bookmarked since a last
recalculation in a first of the plurality of additional fields;

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storing a number of times the web page was bookmarked since a second last recalculation in a second of the plurality of additional fields;

storing a number of times the web page was bookmarked since a third last recalculation in a third of the plurality of additional fields;

5 storing a number of times the web page was bookmarked since a fourth last recalculation in a fourth of the plurality of additional fields;

storing a number of times the web page was bookmarked since a fifth last recalculation in a fifth of the plurality of additional fields; and

10 storing a number of times the web page was bookmarked since an initial sixth last recalculation in a sixth of the plurality of additional fields.

15 26. The system of claim 25, further comprising means for using the sixth of the plurality of additional fields as an accumulator upon each recalculation and for adding the value in the fifth of the plurality of additional fields to the value in the sixth of the plurality of additional fields.

27. The system of claim 26, further comprising means for assigning new values to the plurality of additional fields after each periodic recalculation.

20 28. The system of claim 27, further comprising means for using a predefined formula and the values of the plurality of additional fields to periodically recalculate the score associated with each record in the first database.

25 29. A method for ranking bookmark web pages in a system that is connected to an expanded network, the method comprises the steps of:
bookmarking selected web sites through a browser;
storing records comprising Uniform Resource Locator (URL) associated with each bookmarked web site in a first database; and

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transmitting records associated with bookmarked web sites to the first database, searching the first database, tracking individual records associated with bookmarked web pages, assigning a score to each record, and maintaining the assigned score.

5

30. The method of claim 29, further comprising the step of increasing the record score each time a user bookmarks the web site associated with the record.

10

31. The system of claim 30, further comprising the step of storing the record in the first database in a second database.

15

32. The method of claim 31, further comprising the steps of:
assigning a score to each keyword in a plurality of keywords in a record when the record is first inserted in the first database;
determining if each keyword in the plurality of keywords already exists in another record; and
incrementing the score assigned to each keyword in the plurality of keywords if the keyword exists in another record;

20

33. The method of claim 32, further comprising the steps of selecting a second plurality of keywords with the highest scores and storing the second plurality of keywords in a table.

25

34. The method of claim 33, further comprising the step of periodically recalculating the score associated with the record.

35. The method of claim 34, further comprising the step of storing time periods in a plurality of additional fields in the record.

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36. The method of claim 35, further comprising the steps of:
- storing a number of times the web page was bookmarked since a last recalculation in a first of the plurality of additional fields;
 - storing a number of times the web page was bookmarked since a second last recalculation in a second of the plurality of additional fields;
 - storing a number of times the web page was bookmarked since a third last recalculation in a third of the plurality of additional fields;
 - storing a number of times the web page was bookmarked since a fourth last recalculation in a fourth of the plurality of additional fields;
 - storing a number of times the web page was bookmarked since a fifth last recalculation in a fifth of the plurality of additional fields; and
 - storing a number of times the web page was bookmarked since an initial sixth last recalculation in a sixth of the plurality of additional fields.
37. The method of claim 36, further comprising the steps of:
- using the sixth of the plurality of additional fields as an accumulator after each recalculation; and
 - adding the value in the fifth of the plurality of additional fields to the value in the sixth of the plurality of additional fields.
38. The method of claim 37, further comprising the step of assigning new values to the plurality of additional fields after each periodic recalculation.
39. The method of claim 38, further comprising the step of using a predefined formula and the values of the plurality of additional fields to periodically recalculate the score associated with each record in the first database.

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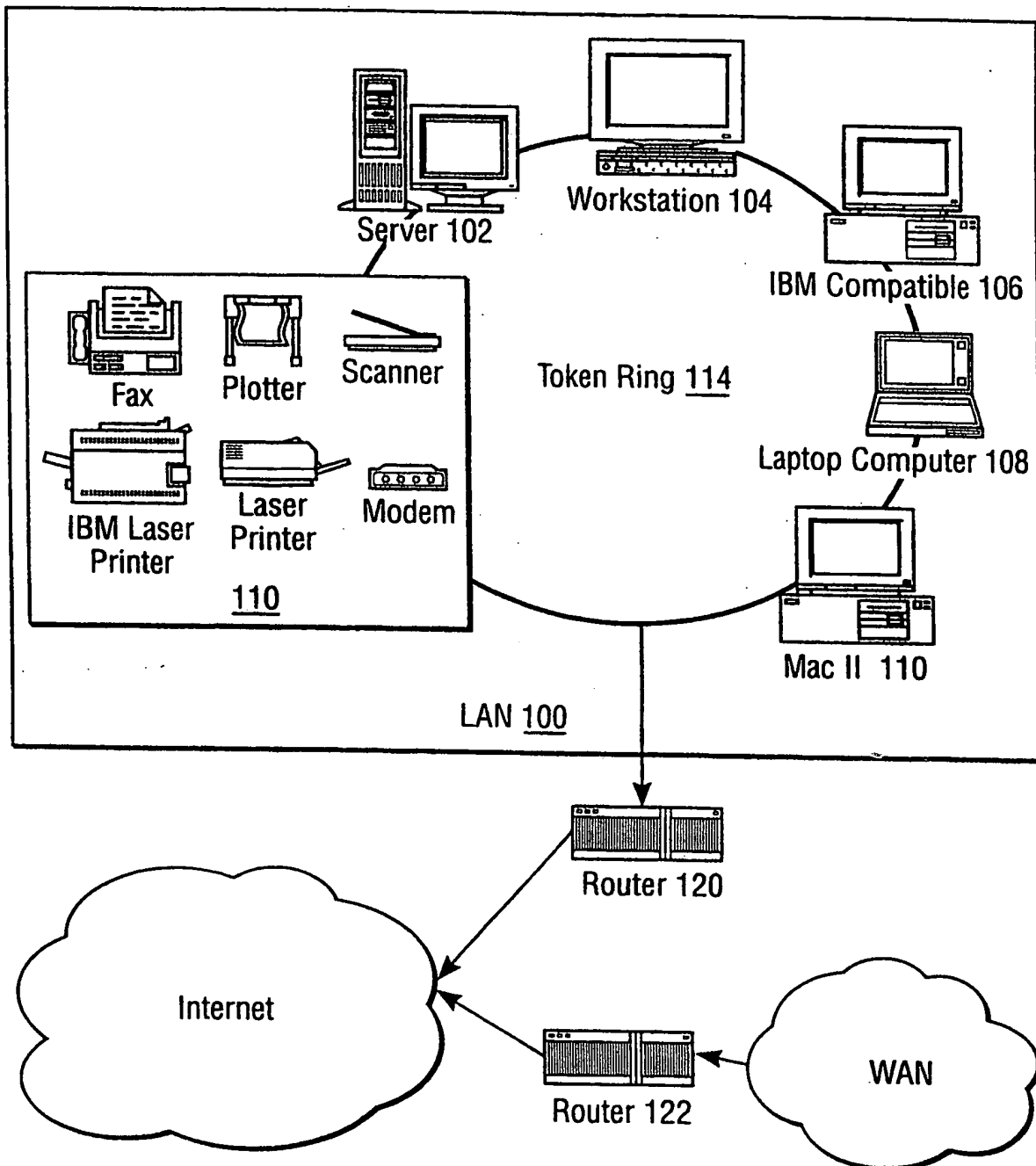
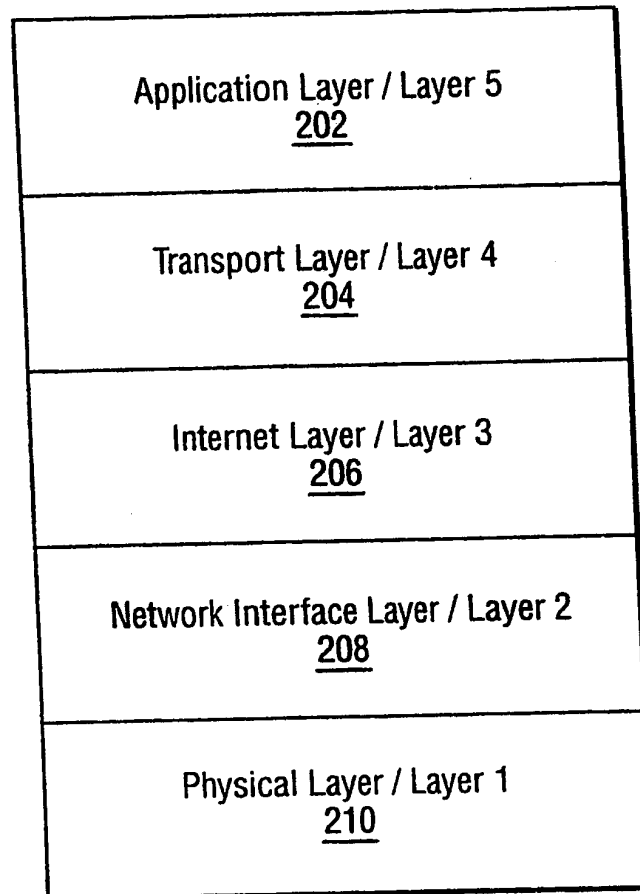


FIG. 1

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TCP/IP Layering Model

FIG. 2

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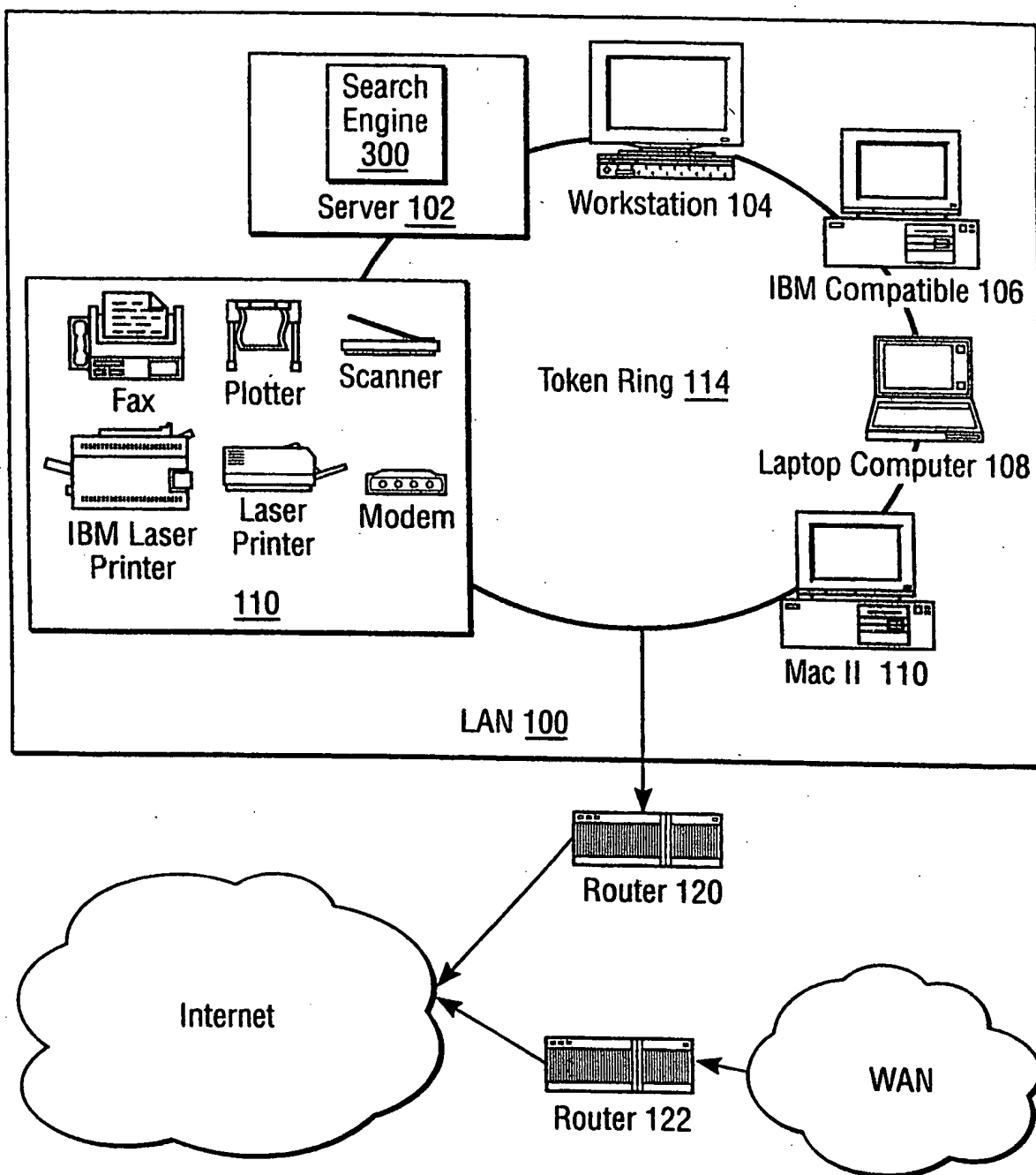


FIG. 3

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402 402 402 402 402 402
Recipe for chocolate chip ice cream
400

FIG. 4-A

Apple -computer delicious

FIG. 4-B

Apple and "Red Delicious" and "Washington State"

FIG. 4-C

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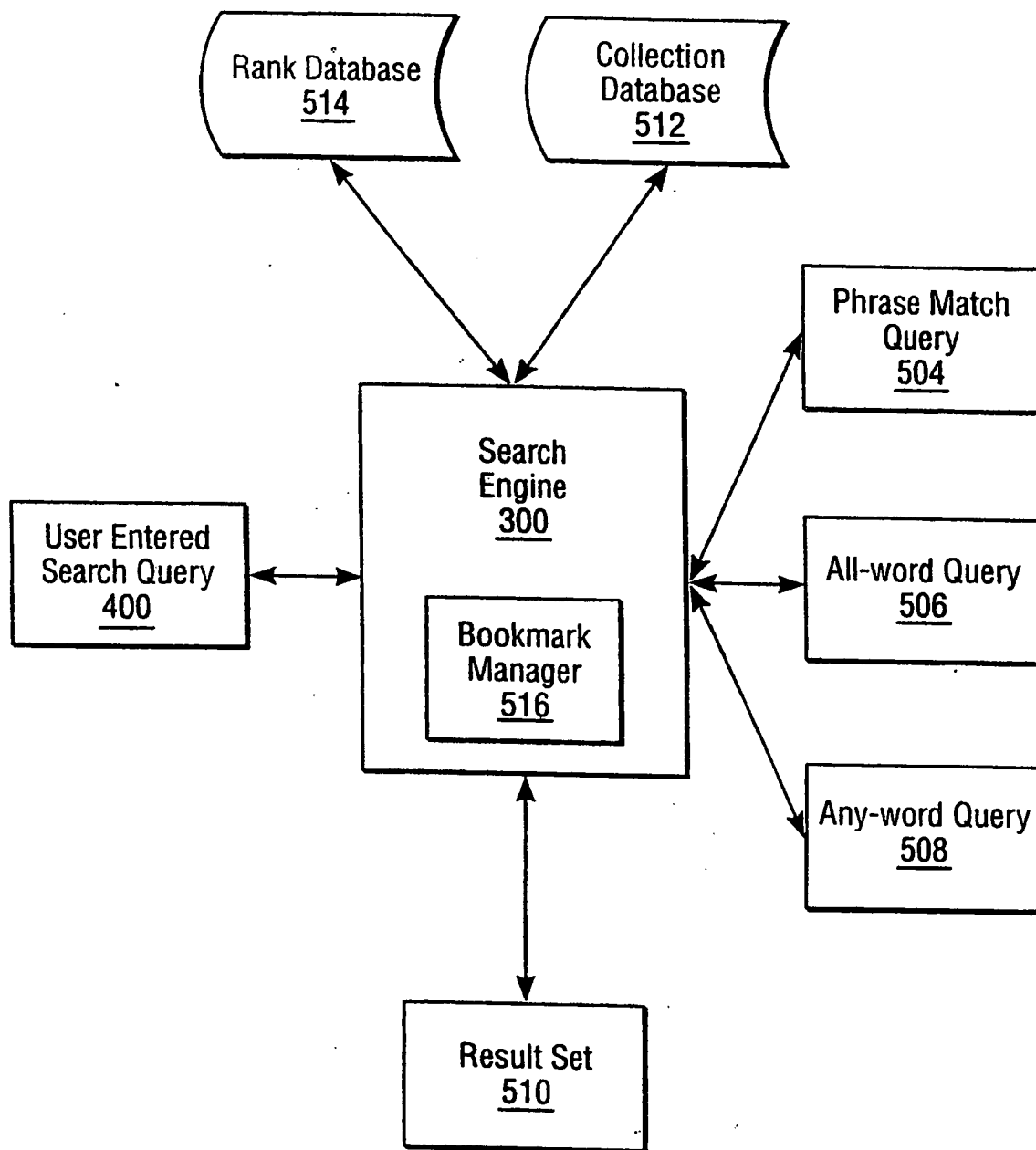


FIG. 5

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Collection Folder - 1		
John Doe Favorites		602
Computer Gaming Sites		604
On-line News Sites		606
Telephones.doc		608
Camera.txt		610
On-line Brokage Sites		612

FIG. 6

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URL	TITLE	COLLECTION PLACEMENT	KEYWORDS	DESCRIPTION	TIME FIELDS
www.washingtonpost.com	Washington Post Home Page	602, 606	News, Weather, Washington, Politics	Washington Post On-line	P1 P2 P3 P4 P5 P6
www.patent.ibm.com	IBM Intellectual Property Network	602	Patents, Products, Search	Search Tool for Patents	P1 P2 P3 P4 P5 P6
...					

FIG. 7

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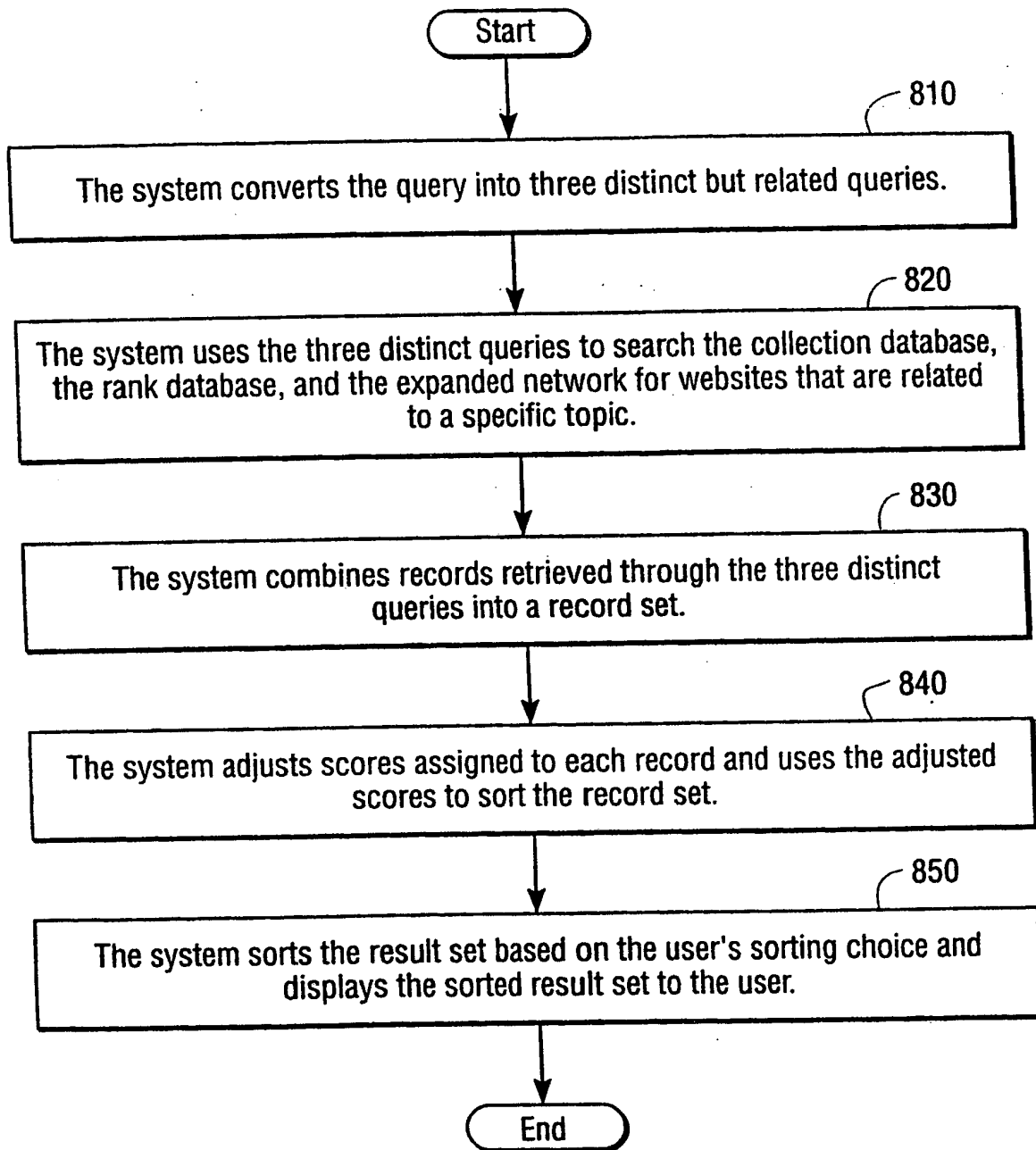


FIG. 8

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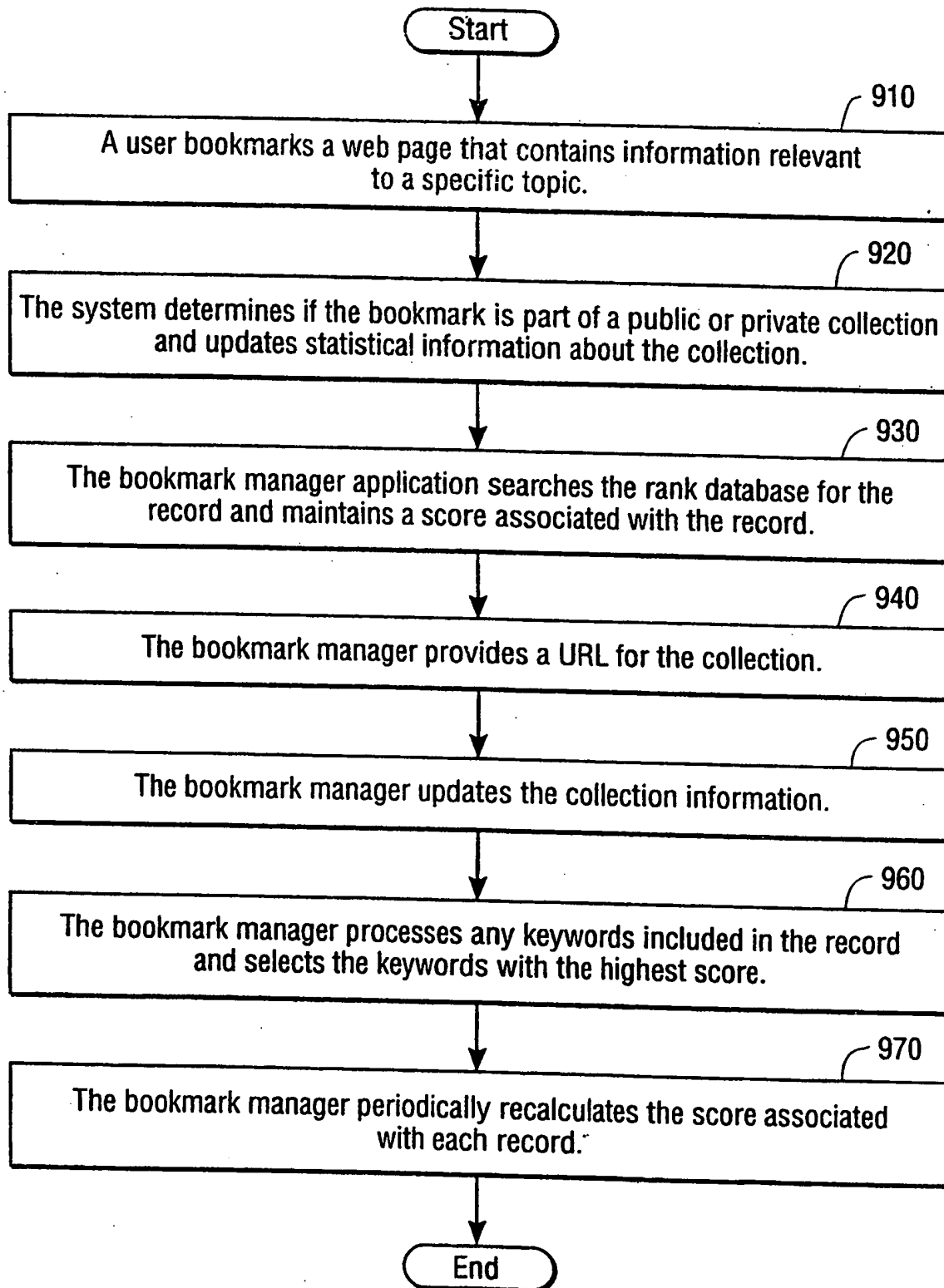


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/24286

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : GO6F 17/30

US CL : 707/202

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/202, 203, 104, 6, 10, 1; 709/245, 246

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST, WEST, CAS ONLINE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, P ----- A, P	US 6,055,542 A [NIELSEN ET AL.] 25 APRIL 2000, SEE FIG 4.	1-9, 16-24, 29-35 ----- 10-15, 25-28, 36-39
Y, P	US 6,041,360 A [HIMMEL ET AL.] 21 MARCH 2000, SEE FIG 4	1-9, 16-24, 29-35

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search

05 OCTOBER 2000

Date of mailing of the international search report

25 OCT 2000

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/34014

Continuation of B. FIELDS SEARCHED Item 3:

WEST Search.

Search terms: (local database, remote database, record or data, large or big or massive or volume, portable or PDA or wireless)

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